EXHIBIT G

FR+A

Forensic Research + Analysis

January 12, 2022

Noah Drew
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RE: *Lunneen v Berrien County*

Decedent: Jack Lunneen
Date of Death: October 22, 2018 (51 years old)
Date of Birth: May 16, 1967

Dear Mr. Drew,

I am in receipt of your correspondence regarding the death of Jack Lunneen. The purpose of this report is to provide my analysis regarding the various potential causes of cardiopulmonary arrest acting on Mr. Lunneen at the time that he became unresponsive while being restrained by law enforcement personnel, and which of the potential causes were the most probable cause (or causes) of his death.

The medical examiner who performed an autopsy on Mr. Lunneen, Dr. Elizabeth Douglas (forensic pathology), concluded that the cause of Mr. Lunneen's death was *excited delirium with methamphetamine use*, with cardiomegaly and hypertension identified as significant contributing findings. The manner of death was undetermined. There were no other explanations for Mr. Lunneen's death described in the autopsy.

Dr. Douglas's attribution of Mr. Lunneen's death to the outdated concept of "excited delirium" (ExDS) is problematic and unhelpful. ExDS is a scientifically discredited concept, which has been promoted for the past several decades as a novel rationale for ignoring the potentially fatal effects of restraint-related asphyxia, when a death occurs in police custody (ExDS is nearly exclusively used as a cause of death when the death has occurred in law enforcement custody). The diagnosis provides an exculpatory explanation for a death that might otherwise be attributed to excessive use of force by law enforcement personnel, and allows for the possible asphyxial effects of law enforcement restraint, no matter how extreme, to be ignored in favor of the ExDS diagnosis.

In this report I will demonstrate that there is abundant evidence that Mr. Lunneen's death resulted from the use of force by Berrien County law enforcement personnel. The most likely mechanism causing his death was cardiopulmonary arrest triggered by restraint-related asphyxia, although other exacerbating factors both related and unrelated to the restraint likely contributed to his death. There are no alternative explanations for Mr. Lunneen's death that are unrelated to the actions of the Berrien County police personnel that are more than slightly possible in the absence of the restraint, however, and there is little to no probability that he would have died in the absence of the actions by police.

My methods and opinions in this case pertain to the fields of forensic medicine and epidemiology. Forensic medicine refers to the intersection of medicine and law, and in particular medicolegal investigation of causation. Epidemiology is defined as the scientific study of the cause of disease, injury, and death in populations, including prevalence, risk, and incidence in specific populations. The scientific field that dictates how probabilities may be inferred from epidemiologic data and methods and how the inferences can be used to assess the cause of injury, disease, or death in individuals in a legal setting is forensic epidemiology. Forensic epidemiology provides the scientific basis for the evaluation of specific causation, to the extent that probability or likelihood of causation may be evaluated. The methods applied in this report are consistent with those outlined in the Reference Guide on Epidemiology, from the Reference Manual on Scientific Evidence, published by the Federal Judicial Center and the National Academies of Science (3rd Edition, 2011), as well as in the text Forensic Epidemiology: Principles and Practice, published by Elsevier (2016).

My qualifications to provide opinions concerning the matters herein are as follows:

I am a consultant in forensic medicine and forensic epidemiology, with extensive training, background, and experience in medicolegal death investigation. I hold the following relevant academic degrees: a doctor of medicine degree (Med.Dr.) from Umeå University (Sweden), a doctor of philosophy (Ph.D.) in epidemiology from Oregon State University, a master of public health (MPH) in epidemiology and biostatistics, also from Oregon State University, a master's degree in forensic medical sciences (MScFMS) with the Academy of Forensic Medical Sciences (UK) and University of Verona (IT), and a Diploma of Legal Medicine (DLM) with the Faculty of Forensic and Legal Medicine of the Royal College of Physicians (UK), *i.a*.

I hold qualification in forensic medicine with the Faculty of Forensic and Legal Medicine of the Royal College of Physicians (UK), and have completed a 2-year post-doctoral fellowship in forensic pathology at Umeå University in Sweden. I am an affiliate medical examiner with the Allegheny County Medical Examiner's office, a fellow of the Pathology section of the American Academy of

Forensic Sciences (AAFS), fellow of the Academy of Forensic Medical Sciences (UK), and a fellow of the American College of Epidemiology (ACE).

I hold national and international positions pertaining to death investigation and forensic medicine, including vice-chair of the US national standards board for medicolegal death investigation for the AAFS, chair of the subcommittee for research at the Faculty of Forensic and Legal Medicine of the Royal College of Physician (UK), and board member of the Academy of Forensic Medical Sciences. I am a US Fulbright fellow, having held a 3-year appointment as a Fulbright Specialist in the field of Forensic Medicine with the U.S. Department of State (2017-20).

I serve as a tenured Associate Professor of Forensic Medicine at Maastricht University, and a Joint Clinical Professor of Psychiatry and Public Health and Preventive Medicine at Oregon Health and Science University School of Medicine, where I have taught courses for the past 20 years in forensic medicine, forensic epidemiology, and medical causation. I have previously held appointments as Adjunct Professor of Forensic Medicine and Epidemiology at the Institute of Forensic Medicine, Faculty of Health Sciences, Aarhus University, Aarhus, Denmark from 2005-2017, and a recent Visiting Professor at University of Indonesia (2020-2021).

I serve or have served as an associate editor or editorial board member of 14 scientific peer-reviewed journals and have published approximately 220 scientific papers, abstracts, book chapters and books, including the recent text for Elsevier, Forensic Epidemiology: Principles and Practice (2016). My scientific publications have been cited by other authors of peer-reviewed publications approximately 3,600 times. Specific to the facts of the present investigation, I have an extensive education, practical investigational experience, and research background into restraint and in-custody deaths. Please see my CV for further details.

I have provided testimony in more than 400 civil and criminal trials in state and Federal courts throughout the United States, Canada, Australia, and Europe.

Background Facts;

On October 22, 2018 at around 01:15, Officer Wyss was in his patrol car in Berrien Springs, Michigan, when a man rode his bicycle up to the car and asked to speak with the officer. The man was reportedly incoherent and agitated, and could not hold still. He mentioned the name "Sergeant Johnson," and then rode away on his bicycle.

Officer Wyss followed the man in his patrol car, but lost sight of him. He came across Sergeant Johnson driving, waved him down, and asked if he knew of the man, but Sergeant Johnson did not recognize the description. While Officer Wyss and Sergeant Johnson were talking, dispatch called to report a destruction of property complaint, involving a man without a shirt.

Officer Wyss and Sergeant Johnson attended the call. While talking with the caller, Officer Wyss spotted a shirtless man, and followed the subject on foot. Officer Wyss radioed Sergeant Johnson to notify him of the suspect's location. Sergeant Johnson found the shirtless man, who "did not appear to be making sense," and radioed for medical assistance, concerned about his inappropriate attire for the weather, which was around 35°F,[1] and the fact that the man was sweating.

Officer Wyss approached the scene of Sergeant Johnson talking with the shirtless man, who he recognized as the man who had approached his car on bicycle earlier, identified as Jack Lunneen. Mr. Lunneen told the officer and sergeant that he was an addict and was in the process of "climaxing." He asked repeatedly for help. He then said, "I know what's happening, you're going to kill me," to which Officer Wyss responded, "Nobody's going to kill you tonight."

Officer Wyss and Sergeant Johnson gave verbal commands to Mr. Lunneen to get on his knees, which he did not do. Sergeant Johnson aimed his TASER weapon at Mr. Lunneen. Mr. Lunneen called for help multiple times, as he walked backwards away from the sergeant and officer, who followed him down the street. Sergeant Johnson then fired his TASER weapon at Mr. Lunneen, making good contact with his torso, and issued a 5-second shock at 01:47:06. Sergeant Johnson and Officer Wyss reported that the shock had no effect on Mr. Lunneen, but bodycam video and audio from Officer Wyss clearly show Mr. Lunneen double over in pain and make grunting sounds, before running off in the opposite direction (see the screen shots below).[2] Mr. Lunneen reportedly grabbed the probe wires and removed the probes.

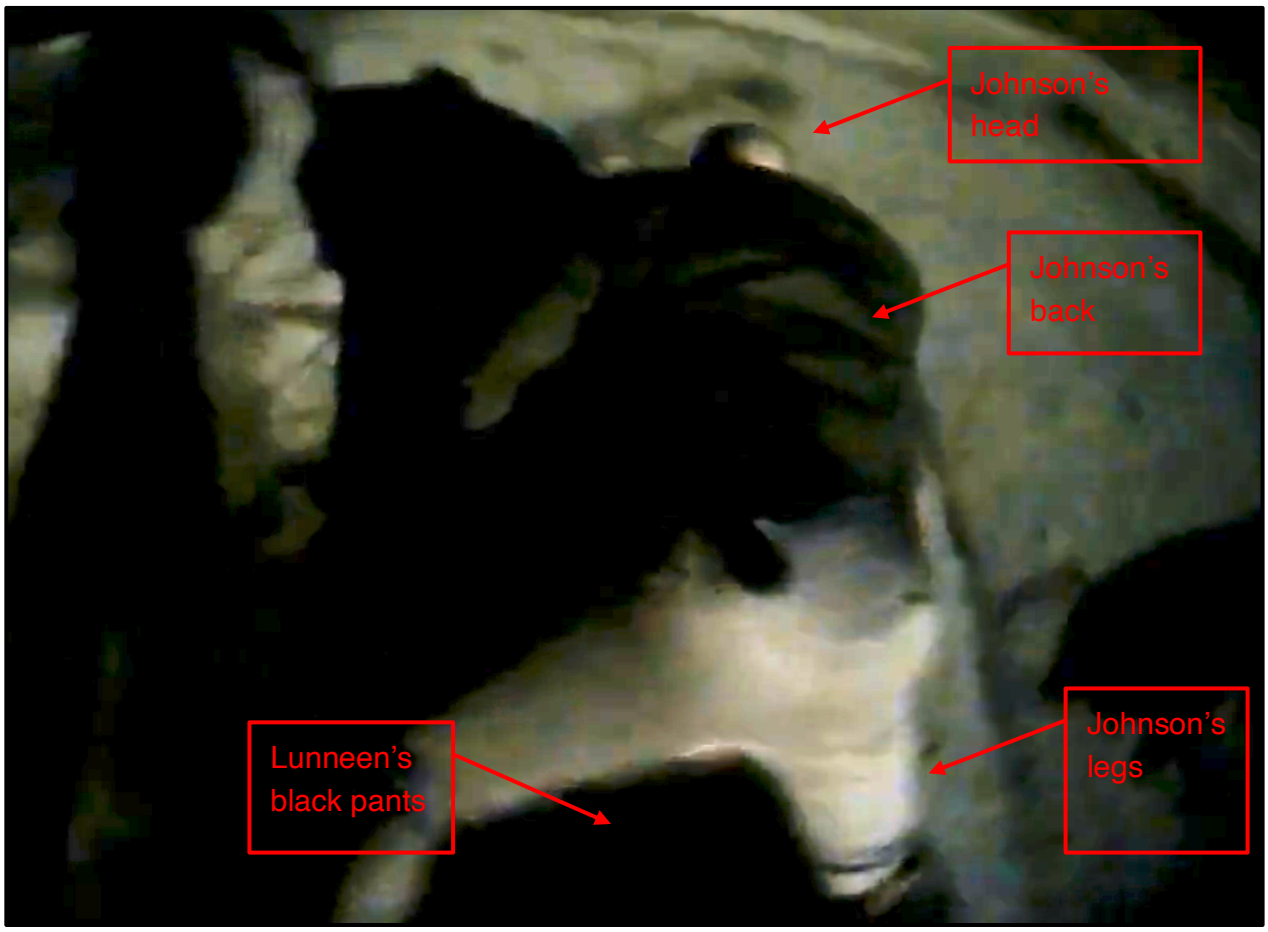
[1] https://www.timeanddate.com/weather/@4985761/historic?month=10&year=2018
[2] Officer Wyss bodycam footage, time: 17:56

Mr. Lunneen facing Sergeant Johnson, just prior to the TASER deployment and shock (screenshot enhanced)

Mr. Lunneen doubling over while the TASER shock is occurring (screenshot enhanced)

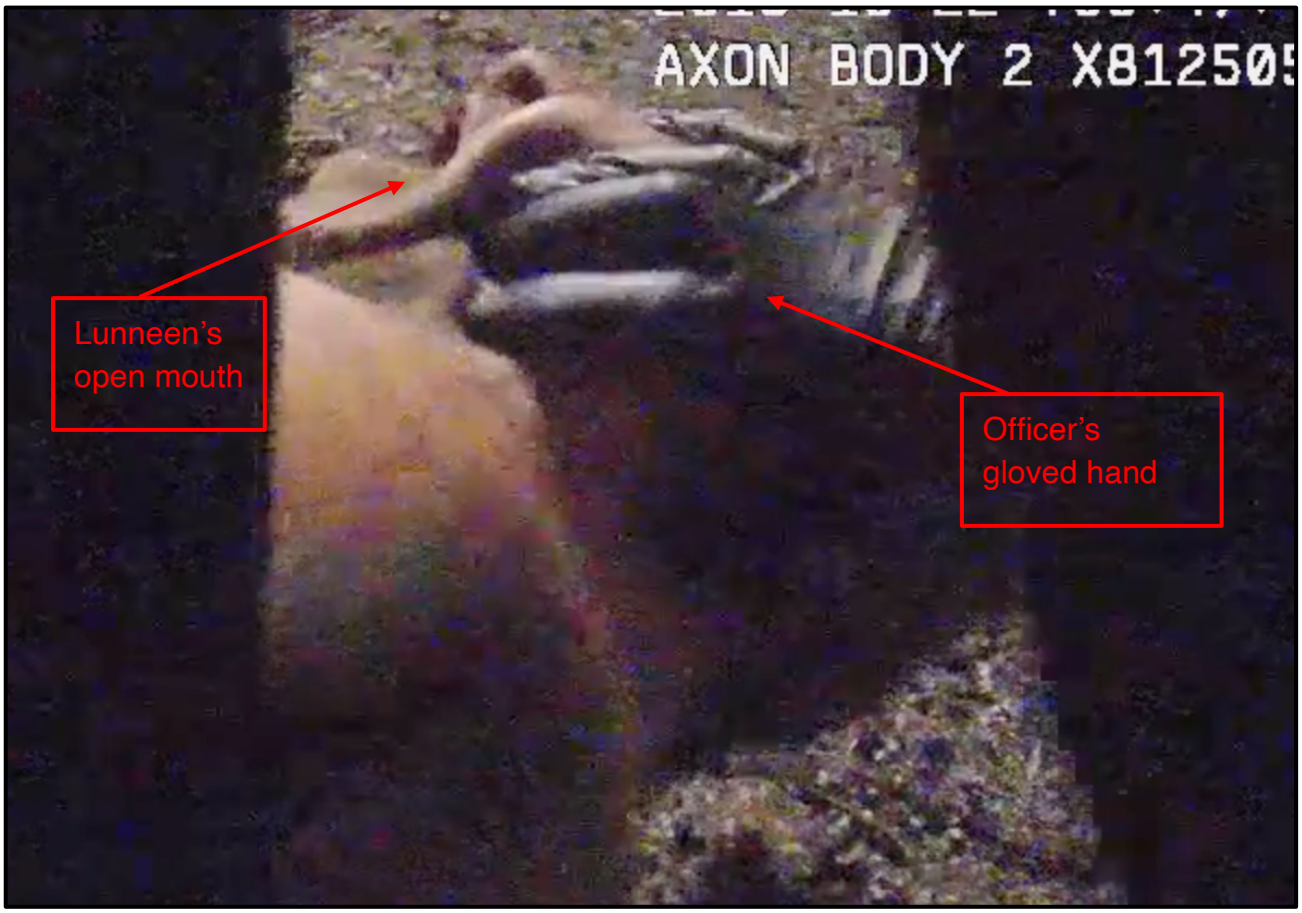
Mr. Lunneen and the Berrien County officers continued in a back-and-forth for nearly 2.5 minutes, during which Mr. Lunneen was either running away from, or toward the officers. Officer Wyss used pepper spray against Mr. Lunneen twice, hitting him once in the side of his head, and the second time hitting him in the face.

The officers took Mr. Lunneen to the ground, where he fell on his side, and continued to resist arrest. Sergeant Johnson used his bodyweight to pin Mr. Lunneen's body, instructing him to turn onto his front so that he could apply handcuffs. An image from Officer Wyss' body camera shows Sergeant Johnson using his bodyweight to pin Mr. Lunneen.[3] The image has been lightened for visibility.



[3] Officer Wyss bodycam footage, time: 20:34

Another officer (identity unknown from the video) attempted to pin Mr. Lunneen's head on the ground for around 35 seconds. An image of a gloved hand of the other office on Mr. Lunneen's face is seen in the screen capture below, from Sergeant Johnson's body camera.[4]



As the officers attempted to handcuff Mr. Lunneen while applying weight to his back and head, he grunted and continued to resist the restraint. His grunts become quieter and shorter, and the last sound he can be heard making was about 20 seconds before he was fully handcuffed, and about 2 minutes after he was initially taken to the ground.[5] When one handcuff had been successfully applied, Mr. Lunneen had stopped moving. Both officers got off of him before the second handcuff was applied.

Officer Wyss reported having "looked and it appeared that Jack was still breathing." Sergeant Johnson claimed he thought Mr. Lunneen was "nodding into an unconscious stupor," and that he could hear a "slight snore."

Sergeant Johnson radioed dispatch to prioritize the medical transport, saying, “He’s having trouble breathing.” Sergeant Johnson then shook Mr. Lunneen’s shoulder and said, “Hey wake up,” but Mr. Lunneen remained unresponsive.

The officers left Mr. Lunneen prone, handcuffed, shirtless, and unresponsive on the nearly freezing pavement, as they waited for the ambulance to arrive, for *nearly 3 minutes after he had stopped moving.*

When the paramedic arrived on scene, Sergeant Johnson reported that Mr. Lunneen was unresponsive. The paramedic checked Mr. Lunneen for a pulse and did not find one, stating, “He’s not even breathing.”

The paramedic asked to remove Mr. Lunneen’s handcuffs and roll him on his back, as he set up a LUCAS CPR machine. It took 4 minutes from the time the paramedic arrived until the LUCAS was functioning, and 7 minutes after he had stopped moving, during which time, *Mr. Lunneen received no CPR or life-saving intervention.*

Resuscitation efforts were not successful, and he was pronounced dead at 02:30 on October 22, 2018.

Autopsy report:
On October 24 and 25, 2018 at 08:45 and 08:00 respectively, an autopsy was conducted by Dr. Douglas. The autopsy was conducted 2 and 3 days after Mr. Lunneen’s cardiac death.

Mr. Lunneen was 5’9” tall and weighed 228 pounds, which classified him as obese with a BMI of 34.

The external examination revealed multiple blunt force injuries to the head, lips, and extensive contusions and abrasions to the trunk and extremities. He also had conjunctival petechiae (in the eyes). There was evidence of TASER probe puncture wounds to the torso, and other evidence of medical intervention.

The internal examination revealed signs of chronic tobacco exposure, including mottling (purpling) of the pleura (the lung membrane), anthracosis of the lungs, intra-alveolar pigment, and mild

[4] Sergeant Johnson bodycam footage, time: 5:58
[5] Officer Wyss bodycam footage, time: 20:46

emphysema. The heart showed signs of cardiomegaly (heart enlargement), mild interfiber and perivascular fibrosis of the left ventricular wall, mild fatty infiltration and persistent fetal dispersion of the AV node and penetrating bundle of His.

A toxicology report using blood taken on October 24, 2018 at 10:00, two days after death, returned a positive result for methamphetamine, at 333 ng/mL, as well as amphetamine.

Analyte Name	Result	Concentration	Units	Therapeutic Range	Loc
AMPHETAMINES	POSITIVE				
Methamphetamine	POSITIVE			Not Established	
Methamphetamine, Quant		333	ng/mL		

Dr. Douglas concluded that the cause of death was due to excited delirium, associated with methamphetamine use, with cardiomegaly. The manner of death was undetermined.

Medical and other records reviewed for history of events

Berrien County Sheriff's department report
Berrien Springs-Oronoko Twp incident report
Statement of Berrien Springs Officer James N. Wyss
BC Sheriff's dept report from Sergeant Roger Johnson
MI State police incident report - Shane Criger
MI State police incident report - Patrol
Taser pulse logs
Lunneen - Berrien county medical examiner report
Officer Wyss Administrative leave letters
BC prosecutor's memo to officers
Denial of criminal charges from prosecutor
Automated incident capture system incident property report
WMU Autopsy Report
Axis toxicology report
Spectrum laboratory reports
Call for service report
9-1-1 call
Jack Lunneen medical records
Jack Lunneen drivers license
Letters of authority
County of Berrien Family division
Trillium employee file

Noah Drew, Esq.

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Video footage:

Jim Wyss body camera footage
Roger Johnson body camera interaction
Unidentified officer body cam video
Johnson no LIEN
101 W Union Vankampen 1 no LIEN
101 W Union Vankampen 2 no LIEN
Cass near Madison Berrien Springs Village Phillips no LIEN
Old US 31 5th 3rd Bank Hahn no LIEN

Analysis and opinions

Injury causation methods

In evaluating the most likely cause of Mr. Lunneen's death, the plausible causes or risk factors for sudden death can be placed in 2 categories: the risks attributable to the actions of the officers (including mechanical obstruction of respiration), and the risk attributable to the conditions present in Mr. Lunneen and unrelated to the actions of the police officers, and described in the autopsy report (Methamphetamine intoxication, Excited Delirium syndrome, cardiac disease). There are no other apparent causes of sudden death for Mr. Lunneen identified at autopsy or in any of the reviewed records.

The investigation of the cause of an injury is different than for a disease, primarily because there is typically a close temporal association between the suspected cause of death and the first signs of injury. There are systematic methods for assessing questions of injury and death causation in a medicolegal setting that have been described extensively in the peer-reviewed literature. Most simply put, an injury causation analysis for a specific individual is performed by assessing the risk of injury from a harmful event and comparing it to the probability that the injuries or conditions would have been present at the same point in time *in the individual* if the harmful event had not occurred.

The analysis is accomplished via the application of expertise and knowledge from several disciplines depending on the source and type of injury, nearly always including medicine and epidemiology[1,2]

In a death investigation involving an autopsy the pathologist identifies, describes, and diagnoses observed conditions, but the determination of the cause of a death in the absence of a condition that is nearly always fatal (*i.e.* gunshot wound to the head) is made via comparison of competing risks of sudden death acting on the individual at the time of the death.[3]

The generally accepted methods for assessing injury and death causation are simply described as a 3-step process based on the Bradford-Hill criteria,[4] which has been extensively described in the peer-reviewed literature, and been deemed generally accepted by US Courts, and described as part of case law in the United States.[5–7]

The three fundamental elements of an injury causation analysis in the context of a death investigation are as follows:

1) **Plausibility:** whether the injury mechanism had the potential to cause the death (general causation), and if known, the magnitude of that potential (risk of death);
2) **Temporality:** the degree of temporal proximity between the injury mechanism and the death; and
3) **Alternative explanations**: whether there is a more likely alternative explanation for the death or fatal injury occurring at the same point in time, versus the investigated cause (also known as a differential etiology). This alternative or competing cause of death or fatal injury is quantified for the individual, given their predictive characteristics and the temporal relationship quantified in step 2.

Analysis of the most probable cause of Mr. Lunneen's death

In the following section of this report is a discussion and analysis of the most probable cause of Mr. Lunneen's death, within the context of the 3-step causal analysis process described above. This process is accomplished by first listing the potential causes of death acting on Mr. Lunneen and assessing which are *plausible*, and then what *risks* are associated with the plausible causes.

The next step in assessing causality is temporality; for the present analysis this consists of a description of the timeframe during which the plausible risk factors would have acted on Mr. Lunneen between the initiation of the restraint by the officers and the time of his cardiopulmonary arrest. The last step of the analysis consists of a quantitative comparison of the magnitude of the risks presented by each of the plausible causes of death (sometimes called a "differential etiology" analysis).

Step 1: Potential causes of Mr. Lunneen's cardiopulmonary arrest and subsequent death

Based on the fact pattern surrounding Mr. Lunneen's death and Dr. Douglas's autopsy findings and report, the list of proposed plausible causes of death for Mr. Lunneen is as follows:

- Restraint related
    - Asphyxia due to abdomen/chest compression
    - TASER shocks
- Non-restraint related
    - Acute methamphetamine toxicity
    - Excited Delirium syndrome
    - Pre-existing cardiovascular disease

The following discussion addresses the plausibility of these potential causes, and, if known or knowable, the risks associated with them:

Restraint-related causes

Asphyxia due to chest/neck compression

As seen on the video footage taken from the body cameras of the Berrien police officers, Mr. Lunneen was subjected to full-body restraint, including force at his head into the pavement sufficient to cause contusions and abrasions to the front and sides of his face and head. Some of these injuries are depicted in the autopsy photographs below.

Asphyxia is defined as a lack of oxygen (*i.e.* hypoxia) caused by an interruption in breathing, and is a well-known trigger of cardiac dysrhythmia and arrest.[8] Compression of the neck, chest, and abdomen during physical restraint is an asphyxial mechanism resulting from restricted inspiration.[9] Positional asphyxia, in the context of restraint, typically refers to increased difficulty with breathing that is associated with the use of restraint (*i.e.* handcuffs, hobble restraint) that is

used on a prone person, but can occur in any position in which a person is forced into a position that limits their ability to breathe. The terms compression and position are sometimes used interchangeably when referring to the circumstances of asphyxial death.

Obese individuals with a protruding belly like Mr. Lunneen are at heightened risk of positional asphyxia when in a prone position, due to pressure against the diaphragm by the belly, thus restricting gas exchange in the lungs.[10] The restraint conditions that Mr. Lunneen was subjected to during his arrest have been demonstrated to result in impaired breathing capacity and lung function.

A study published in 2021 sought to evaluate the lung reserve volume in subjects under the cumulative circumstances potentially experienced during police restraint. The authors evaluated the effect on lung function of 1) physical exertion, 2) prone positioning, 3) restraint, and 4) body compression, individually, and in combination.[11] The authors designed a non-invasive method for measuring ventilation in 17 volunteers under 5 scenarios: 1) standing upright, 2) unweighted in a prone position, 3) weighted and in a prone position, 4) weighted in a prone position, while restrained *and* after exercise, and 5) unweighted in a prone position while restrained. In scenario 4, after the subjects engaged in vigorous stationary bicycling for 10 minutes, they were either placed prone with weight on their back and with their hands by their side (serving as a control), or with their hands clasped behind their back (restraint position 1), or with their hands clasped behind their head (restraint position 2).

The primary outcome in the study was change in functional residual capacity (FRC) of the lungs, which is the volume remaining in the lungs after a normal exhalation. Increased FRC indicates the person is breathing well, and decreased FRC indicates the opposite. The authors found that after subjects engaged in exercise and were put in a prone position with 35% bodyweight on their back, whether their hands were at their sides (the control), behind their back (restraint 1), or behind their head (restraint 2), all subjects experienced significantly decreased FRC.

Perhaps most importantly, over the 5 minutes they remained in that position, the control group stayed at the same rate of decreased FRC, while restraint 1 and 2 groups experienced *steadily decreasing FRC*. The authors theorized that the restraint positions prevented adequate muscle recruitment needed to assist the diaphragm to breathe, while the control position allowed for abdominal muscle recruitment for respiration. When the weight was taken off the restrained subjects' backs, the FRC gradually returned to pre-exercise levels.

The study conclusively demonstrated that a prone and restrained individual who also pinned to the ground with the equivalent of at least 35% of their body weight on their chest or back, will

incrementally experience worsened breathing function, until the weight is removed. The study also identified a dose-response relationship between increased aggressivity of restraint and decreased lung capacity. These results are relevant to the death of Mr. Lunneen, in that they point toward the handcuffing, restraint, and prone positioning as triggers for his cardiopulmonary arrest.

At autopsy, Dr. Douglas noted and documented petechiae in the conjunctiva of both of Mr. Lunneen's eyes. Petechiae are small pinpoint hemorrhages which indicate mechanical obstruction of venous return to the head, and associated restriction of respiration. Petechiae can be seen anywhere in the body, but when they are found in the white (sclera) and conjunctiva of the eyes, they are most often associated with asphyxia, and manual strangulation, in particular.

In the below image from Sergeant Johnson's body camera, a gloved hand can be seen applying pressure to Mr. Lunneen's neck.[6]

[6] Sergeant Johnson body camera footage, time: 6:06

While difficult to quantify (as the duration of the neck hold was brief), the degree of compression at Mr. Lunneen's neck is reasonably associated with the petechiae observed at autopsy, and as such may have contributed the restraint-related asphyxial forces applied to Mr. Lunneen's body.

Based on the preceding discussion, the restraint applied to Mr. Lunneen while he was prone and handcuffed, in combination with the other draws on his oxygen reserves (agitation, exertion, methamphetamine intoxication, cold weather, and inflicted pain), serve as a highly plausible trigger for the cardiopulmonary arrest that resulted in his death.

Electrical shock from a conducted electrical weapon (TASER)

While he was pursued on foot by the officers, Mr. Lunneen was electrically shocked by Sergeant Johnson for 5 seconds with a conducted electrical weapon (CEW), or TASER. Both Sergeant Johnson and Officer Wyss claimed in their incident reports that the TASER shock had no effect on Mr. Lunneen when it was applied, but the claims are belied by the video footage from Officer Wyss's body camera, which clearly show Mr. Lunneen doubling over and grunting as if from pain, before he turns and runs from the police.

TASERs are designed to incapacitate an individual using painful electric shocks. The models used by law enforcement personnel typically have projectiles, connected to the device via thin wires, so that the electric shock can be administered at a distance. The introduction of an electrical current into the human body is a highly plausible and well-established mechanism for producing cardiac dysrhythmias (when deployed on the torso), and thus it is unsurprising that law enforcement use of TASER has been associated with over 630 deaths between 2001-2014.[12]

While some volunteer studies have demonstrated that TASER use is a generally (if not universally) safe restraint technique, none have accurately recreated the events that lead to TASER shocks in the real world. Individuals who are tased often have mental illness or drug associated psychosis and delirium, as well as concurrent restraint effects (*i.e.* prone position, multiple officers' bodyweight, handcuffs), and sustain *multiple* TASER shocks, all occurring in the context of vigorous struggle and resisting of arrest.[13,14]

Ordinarily, a TASER shock carries a very low risk of cardiac arrest when used by law enforcement against a suspect. The use of a TASER causes excruciating pain (which is the intent of the use of the device), which in turn serves to increase the need for oxygen in a tased individual.[15] The video footage of Mr. Lunneen clearly demonstrates that he was in pain from the TASER shock, which would have increased his need for oxygen, at a time when he was already at increased need for oxygen (due to activity, intoxication, and agitation).

Non-restraint-related causes

Acute methamphetamine toxicity

Mr. Lunneen was found to have a postmortem blood concentration of methamphetamine of 333 ng/mL or 0.33 mg/L. Methamphetamine is a stimulant that is primarily consumed illegally as "crystal meth," or simply "meth," in a powder form that can be smoked, injected, or ingested orally. Use of the drug is highly prevalent; there were 42 tons of crystal meth consumed in the US in 2010, and in 2013 1.2 million Americans used the drug.[16]

In contrast with opiates, however, crystal meth has a relatively low hospitalization and death rate; there were 103,000 emergency room visits associated with meth use in 2011, and in the same year there were ~2,700 deaths attributed, at least in part, to meth exposure, resulting in a death rate of 1 in 444, relative to the number of people taking the drug annually (the deaths were not all necessarily due to methamphetamine toxicity, however). As the typical dose of meth ranges from 10 to 40 mg, this means that there are at least 11,340 doses available per pound of meth, (assuming a 40 mg dose), 22.7 million doses per ton of meth, and thus a total of 953 million doses of meth consumed in the US in 2010 alone.[17] A comparison of the number of doses to the number of deaths each year yields a risk of 1 death per 353,000 doses of methamphetamine.[18] While no illicit drug use is considered "safe" (and thus any level in the body is considered toxic), the risk of death from a single dose of methamphetamine is exceedingly small.

There is no evidence that supports the implication that the very small amount of methamphetamine in Mr. Lunneen's blood (0.33 mg/L) was even a *plausible* cause of his death in the absence of the violent restraint. The level of methamphetamine assayed in Mr. Lunneen's postmortem blood sample is less than what is commonly found in recreational users, a fact that is established in a publication by the National Highway Traffic Safety Administration.[17] Other studies have described non-lethal blood concentrations in recreational methamphetamine users of as high as 9.3 mg/L (+27 times greater than the level found in Mr. Lunneen's blood).[19] While methamphetamine deaths have been recorded with blood levels as low as 0.05 mg/L this information is essentially useless in the present investigation. There is extensive overlap between what are only *possibly* fatal levels and common recreational blood concentrations of methamphetamine.

Given the exceedingly low per-dose risk of death associated with methamphetamine use, there is no reason to believe that simply because Mr. Lunneen had methamphetamine in his blood that *might possibly* be fatal, that the cause of his death was related to methamphetamine toxicity. Methamphetamine isn't like cyanide or some other poison, which is invariably the cause of death when it is found in a decedent. Like alcohol, most of the time that amphetamine is present in a decedent it is *not* the cause of death. Thus, at the levels found in Mr. Lunneen's blood two days

after he died, methamphetamine toxicity was a highly unlikely cause of his death, in the absence of the restraint-related death risk.

Excited Delirium Syndrome

Dr. Douglas opined that Mr. Lunneen's death was due primarily to excited delirium syndrome (ExDS). ExDS, (also known as agitated delirium, AgDS) is a diagnostic term used to describe a person who is agitated and delirious, usually paired with aggressive behavior, pain tolerance, extreme physical strength, and hyperthermia. Often people with alleged fatal ExDS have recently ingested a stimulant drug (*i.e.*, meth or cocaine) and/or are mentally ill. Because of the erratic behavior, law enforcement is called to contain and restrain the individual, which is typically met with resistance (because of the agitation and delirium), leading to an escalation of restraint techniques such as TASER shocks, extensive restraint via manhandling, hog- or hobble-tying, the use of blunt force, and sedation, ultimately culminating in the death of the individual. There are no findings at autopsy that indicate ExDS as a cause of death, and if drugs are found in the toxicology screen, they are typically stimulants, and at recreational, rather than overdose, levels.

The diagnosis of ExDS is highly controversial when it is named as the primary cause of death in cases in which there is a history of restraint at the time of death. The symptoms of ExDS (agitation and delirium) are triggers for use of force and restraint by law enforcement, and use of force by law enforcement can be associated with increased risk of death due to positional/compression asphyxia. Asphyxial or restraint-related deaths *can* exhibit signs of the mechanism of death, such as fractured ribs, neck structures, petechiae of the eye and neck muscles, but these findings are often not present.

ExDS is not a term defined in the International Classification of Diseases (ICD-9, ICD-10), or the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), and there is no standard definition of ExDS and no definitive tests or signs to indicate the diagnosis as a cause of death, and thus the use of the term is entirely subjective. Previous studies attempting to classify, define, and estimate risk factors for ExDS have been limited to case reports and case series.

In a recently published peer-reviewed article, my colleagues and I created a database of all individual (rather than grouped) ExDS and AgDS cases that have been described in the scientific literature using the National Library of Medicine search engine PubMed and OVID Medline, as well as "grey literature" available in Google Scholar searches using the relevant search terms.[18]

We found a total of 1,342 studies which were initially reviewed, resulting in the identification of 61 articles describing individual cases of ExDS or AgDS, amounting to 168 total cases. The cases were reviewed, and available information was harvested for diagnoses (ExDS vs. AgDS), the type of

authority present (law enforcement, paramedic, etc.), demographics (age, sex, race), use of force (not mutually exclusive: none, unknown, handcuff, hog/hobble-tie, manhandle, TASER, sedation, other), drug intoxication (not mutually exclusive: none, unknown, cocaine, alcohol, marijuana, stimulants, other), mental health diagnosis, and outcome (died or survived).

Most cases involved men (*n*=161, 95.8%), and law enforcement personnel were the first responders on scene in two thirds of the cases (*n*=111, 66.1%). A quarter of the cases involved a person with a known mental illness (*n*=42, 25.0%), most cases involved drug use (*n*=147, 86.3%), and force was used in most cases (*n*=138, 81.5%).

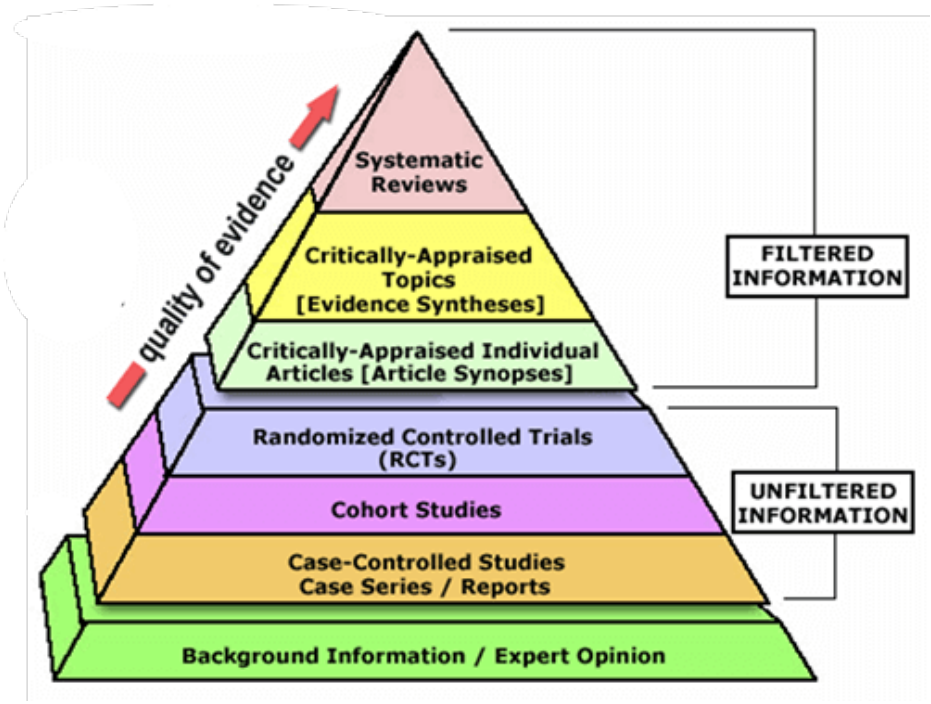
Cases that resulted in death were nearly 10 times more likely than survived cases to be diagnosed as ExDS (rather than AgDS). Fatal cases were also more likely to have used restraint (at least 90% of cases) than survived cases (at least 68% of cases). Cases were more likely to be fatal when law enforcement was the first responder on scene. The odds of fatality were 7.4 times greater when a person was manhandled, 10.7 times greater when they were handcuffed, and 50 times greater if a person was hog- or hobble-tied. Fatal cases were also more likely to have cocaine and/or alcohol, while survived cases more commonly involved other stimulants, marijuana, and other drug use (*i.e.*, opioids, mushrooms, hallucinogenic drugs, etc.).

The results of the study indicated that a diagnosis of ExDS and potentially fatal restraint are inextricably interwoven, and that in the absence of aggressive restraint (*i.e.*, manhandling, hog-tying, handcuffing), there is no evidence that ExDS is a stand-alone fatal condition. Additionally, we found a dose-response between the aggressivity of the restraint and the risk of death, which can only be explained by restraint, rather than ExDS, as the cause of death.

These findings are relevant and applicable to the circumstances of Mr. Lunneen's death, in that they point toward the aggressive restraint used on him as a far more likely cause of his cardiopulmonary arrest than his state of delirium and agitation, which carries little to no risk of sudden death.

Our 2020 peer-reviewed paper was the highest ranked level of evidence ever published on the relationship between ExDS, restraint, and risk of death. The diagram below demonstrates that our literature review and pooled case analysis paper constitutes **Level 1** evidence (Evidence Syntheses), whereas previously published papers on ExDS (primarily case series, case reports, and opinion pieces) **Level 4 and 5** evidence:[7]

[7] https://www.library.qut.edu.au



The paper has also become the leading scientific article on the topic since its publication. At the time of this report, the article is in the top 0.05% of all 20 million research outputs evaluated for impact (#10,941 out of 19,870,288 research outputs), and was ranked #1 of 800 research outputs by *Forensic Science, Medicine, and Pathology*, the journal in which it is published.[8]

ExDS has been repeatedly rejected as a valid diagnosis by the American Medical Association, and the publishers of the DSM-5, the American Psychiatric Association. Indeed, in June of 2021, the American Medical Association formally announced their opposition to the diagnosis of ExDS (citing, as partial support, our 2020 literature review and pooled case analysis), noting both that the AMA does not support ExDS as an official diagnosis, and that suspicion of the condition is not a justification for law enforcement use of force (as occurred with Mr. Lunneen).

[8] https://help.altmetric.com/support/solutions/articles/6000233311-how-is-the-altmetric-attention-score-calculated-

Cardiovascular disease

The post-mortem examination of Mr. Lunneen's heart revealed cardiomegaly (enlargement of the heart) which was deemed by Dr. Douglas to be likely hypertensive in origin, mild interfiber and perivascular fibrosis of the left ventricular wall, mild fatty infiltration and persistent fetal dispersion of the AV node and penetrating bundle of His, based on histological examination. Dr. Douglas noted at deposition the well-established fact that the heart pathologies identified during Mr. Lunneen's autopsy are common findings in older obese men.[9]

While the heart conditions found at autopsy are a common linked to morbidity and death in the general population, the changes in Mr. Lunneen's have been likely present and evolving for decades, and do no indicate a significant increased risk of sudden cardiac death, in the absence of the restraint related asphyxia. There is no available medical information that indicates that Mr. Lunneen was at imminent risk of any cardiac event at the time of his fatal encounter with the Berrien County police.

As an illustration of how remote Mr. Lunneen's risk of a sudden cardiac death was at the time of his death, epidemiologic study indicates that the risk of sudden cardiac death in the general population of adult men aged 45-59 is 35.9 per 100,000 per year, or 1 in 2,786.[10] Even if I assume that Mr. Lunneen was in the least healthy 10% of his population with regard to cardiac health (an overestimation of the impact of his cardiac pathology relative to the general population of his age, as more than 1/3rd of men in the age group are obese and have hypertension, and related cardiac changes)[11], this would make his *annual* risk of sudden cardiac death 1 in 279.

Applying this annual risk to the 2-minute period during which Mr. Lunneen was also at risk of cardiopulmonary arrest due to aggressive restraint-related asphyxia results in a risk of sudden cardiac death of approximately 1 in 146 million.[12] Thus, Mr. Lunneen's cardiac pathology was an exceedingly unlikely cause of his death in the absence of the positional asphyxia resulting from the violent restraint used on him.

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[9] Elizabeth Douglas, MD, deposition taken December 28, 2021, page 42

[10] Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple cause of death, 1999-2016. CDC Wonder online database. Released December 2017. Atlanta, GA. Accessed November 12, 2020. Retrieved from http://wonder.cdc.gov/mcd-icd10.html

[11] https://www.cdc.gov/nchs/data/databriefs/db289.pdf

[12] There are 525,600 2-minute intervals in a year, and thus [278/525,600] = 1 in 146,116,800.

Step 2: The timing of events leading to Mr. Lunneen's death

The table on the following page was created after reviewing the body camera footage and audio of the Berrien County police officers. Officer Wyss and Sergeant Johnson were the first on scene, and the only officers to interact with Mr. Lunneen before his cardiopulmonary arrest. There is limited and relatively poor quality video footage of the restraint used on Mr. Lunneen in the moments leading to his cardiopulmonary arrest, due to camera and body positioning of the officers.

The table begins when Sergeant Johnson first contacted Mr. Lunneen. The first column is the timestamp from the overall interaction, beginning at 00:00 when Sergeant Johnson initiates contact, the second column is a brief description of the event.

Time from initial contact	**Action**
00:00	Johnson makes contact with Lunneen
00:33	Wyss joins the scene
01:26	Lunneen says, "I'm an addict… Right now, I'm climaxing"
02:06	Wyss grabs for Lunneen's arm. Lunneen walks backward away from officers, who walk toward him, telling him to get on his knees. Johnson's TASER is pointed at Lunneen
03:33	Johnson TASER shocks Lunneen
04:23	Wyss pepper sprays Lunneen
04:37	Officers take Lunneen to the ground. Lunneen resists restraint.
06:22	Last sound Lunneen can be heard making.
06:40	Lunneen stops moving, is fully cuffed. Officers get off of Lunneen before second cuff is applied.
06:57	Johnson calls dispatch to hurry medic, says, "He's having trouble breathing"
07:12	Johnson shakes Lunneen, says, "Hey wake up," to no avail.
09:36	Paramedic arrives on scene
11:15	Lunneen uncuffed and rolled onto his back
13:40	Paramedic successfully applies CPR device, resuscitation efforts begin

Mr. Lunneen became unconscious and stopped moving before the handcuffs were applied, and before Sergeant Johnson stood up from applying full bodied restraint. Less than 20 seconds after standing, Sergeant Johnson reported that Mr. Lunneen was "having trouble breathing." He was then left handcuffed and prone for more than 4.5 minutes after he had stopped moving, and before his handcuffs were removed and he was rolled onto his back.

The timing between the application of aggressive restraint tactics and Mr. Lunneen's alteration in breathing and loss of consciousness indicating cardiopulmonary arrest is appropriate in both sequence and proximity to causally relate the restraint to the arrest.

An additional factor to consider is the time between when Mr. Lunneen first become non-responsive, and when CPR was finally initiated after setup of the LUCAS machine (which was around 4 minutes after Mr. Lunneen's pulse is first checked by the paramedic, and 7 minutes after he becomes non-responsive). The lack of manual CPR from either police or paramedic personnel for 7 minutes made it far less likely that Mr. Lunneen would have survived the cardiopulmonary arrest.

Step 3: Alternative explanations for Mr. Lunneen's cardiopulmonary arrest, aside from restraint-related asphyxia

Based on the discussion under Step 1 above, of the potential causes of Mr. Lunneen's death, only the police actions of positional/compressive asphyxia and TASER use, and the non-police-related conditions of acute methamphetamine toxicity and cardiovascular disease are plausible competing risks for his death.

ExDS cannot be considered a competing cause of Mr. Lunneen's death, as in the context of aggressive restraint the diagnosis has no meaning (as a cause of death). There is no valid scientific evidence that ExDS is even a *possibly* fatal condition when aggressive and potentially asphyxial restraint methods are occurring at the time of a cardiopulmonary arrest.

As described above under Step 1, the risk of sudden death associated with the 2 non-police causes is less than trivial; the presence of methamphetamine in Mr. Lunneen's blood represented a <1 in 350,000 risk, and the cardiovascular disease risk was likely less than 1 in 146 million during the period of restraint.

In comparison, the risk of death from the police actions was relatively high. These actions increased Mr. Lunneen's need for oxygen, which was followed by aggressive weighted prone restraint, which decreased his ability to breathe. The only apparent explanation for Mr. Lunneen's sudden cardiopulmonary arrest is the asphyxial actions of the police. Undoubtedly, Mr. Lunneen's ability to tolerate hypoxia without suffering a cardiac arrest was decreased by the presence of methamphetamine in his system, and the pre-existing (but apparently asymptomatic) cardiac pathology.

Conclusions:

Based on the preceding analysis, it is my opinion that Mr. Lunneen's death was the result of the use of excessive force by the Berrien County Police Department personnel, resulting in death by asphyxia-triggered cardiopulmonary arrest. Because Mr. Lunneen's death was due to the intentional actions of others, his manner of death was a homicide, rather than undetermined. This finding is consistent with the National Association of Medical Examiners (NAME) guideline on classifying manner of death, which states the following, on page 11:

> *"Deaths due to positional restraint induced by law enforcement personnel or to choke holds or other measures to subdue may be classified as Homicide. In such cases, there may not be intent to kill, but the death results from one or more intentional, volitional, potentially harmful acts directed at the decedent (without consent, of course). Further, there is some value to the homicide classification toward reducing the public perception that a "cover up" is being perpetrated by the death investigation agency."*

The preceding opinions were given as reasonable medical and scientific probabilities. I reserve the right to amend any of my opinions should new information come to light.

Very truly yours,

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